

299-E33-6 (A6852) Log Data Report

Borehole Information:

Borehole: 299-E33-6 (A6852)		Site: West of 216-B-48 & 49 Cribbs			
Coordinates (WA State Plane)		GWL (ft)¹: 232.4	GWL Date: 9/10/2002		
North	East	Drill Date	TOC² Elevation	Total Depth (ft)	Type
137,655.87 m	573,574.4 m	April 1955	628.18 ft	241.3	Cable Tool

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Welded steel	3.4	8 5/8	8	5/16	0	232.4
Welded steel	3.25	4 1/2	4	1/4	0	212.4

The logging engineer measured the casing stick up using a steel tape. A caliper was used to determine the outside casing diameter. The caliper and inside casing diameter were measured using a steel tape. These measurements were rounded to the nearest 1/16 in. Casing thickness was calculated. The 4-in. casing was measured using a steel tape; measurements were rounded to the nearest 1/16 in. Casing bottoms are as reported from the well construction summary report relative to TOC.

Borehole Notes:

Borehole coordinates, elevation, and well construction information, as shown in the above tables, are from measurements by Stoller field personnel and Ledgerwood (1993). The depths have been adjusted to TOC. Zero reference is the top of the 8-in. casing. Top of casing stickup is for the most part evenly cut. A reference point survey "X" is located on top of the casing stickup. The borehole was checked for straightness before logging began.

Logging Equipment Information:

Logging System:	Gamma 1D	Type:	SGLS (35%)
Calibration Date:	07/01/01	Calibration Reference:	GJO-2002-243-TAR
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4	5
Date	09/10/02	09/10/02	09/11/02	09/12/02	09/12/02
Logging Engineer	Spatz	Spatz	Spatz	Spatz	Spatz
Start Depth (ft)	241.5	199.0	147.0	72.0	46.0
Finish Depth (ft)	200.0	146.0	48.0	47.0	4.0
Count Time (sec)	100	200	200	200	200
Live/Real	R	R	R	R	R
Shield (Y/N)	N/A ³	N/A	N/A	N/A	N/A
MSA Interval (ft)	0.5	1.0	1.0	1.0	1.0
ft/min	N/A	N/A	N/A	N/A	N/A
Pre-Verification	AD034CAB	AD034CAB	AD035CAB	AD036CAB	AD036CAB
Start File	AD034000	AD034084	AD035000	AD036000	AD036026

Log Run	1	2	3	4	5
Finish File	AD034083	AD034137	AD035099	AD036025	AD036068
Post-Verification	AD034CAA	AD034CAA	AD035CAA	AD036CAA	AD036CAA
Depth Return Error (in.)	N/A	-1	-1	N/A	0
Comments	No fine-gain adjustment.	No fine-gain adjustment.	No fine-gain adjustment.	Repeat section. No fine-gain adjustment.	No fine-gain adjustment.

Logging Operation Notes:

Zero reference was TOC (8-in. casing). Logging was performed without a centralizer installed on the sonde. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT verifier with serial number 118. After log run 1, counting times were increased from 100 seconds to 200 seconds to compensate for the dual casing above 212 ft.

Analysis Notes:

Analyst:	Sobczyk	Date:	09/23/02	Reference:	GJO-HGLP 1.6.3, Rev. 0
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SGLS pre-run and post-run verification spectra were collected at the beginning and end of each day. The verification spectra were all within the control limits. The peak counts per second (cps) at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectra as compared to the pre-run verification spectra for each day were lower and between 5 and 9 percent of one another.

Log spectra for the SGLS were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source file: G1DJul01.xls). Zero reference was the top of the 8-in. casing. The casing configuration was assumed to be a string of 8-in. casing with a thickness of 0.322 in. to a log depth of 232.4 ft and a string of 4-in. casing with a thickness of 0.237 in. to a log depth of 212.4 ft. Below 232.4 ft, the hole was open. The casing thicknesses of 0.322 and 0.237 in. are the published values for 8- and 4-in. ASTM schedule-40 steel pipes (commonly used casing materials at Hanford). These casing thicknesses are within the range of measurement error associated with the logging engineer's measurements. Where more than one casing exists at a depth, the casing correction is additive (e.g., the correction for both an 8-in. and 4-in. casing would be $0.322 + 0.237 = 0.559$). A water correction was applied to the SGLS data below 232.4 ft.

Dead time corrections are required when dead time exceeds 10.5 percent. Dead time exceeded 10.5 percent in the intervals from 19 to 26 ft, 30 to 43 ft, and 49 to 51 ft. Dead time greater than 40 percent was encountered at 23 and 24 ft, and data from these regions were considered unreliable. At SGLS dead time greater than 40 percent, peak spreading and pulse pile-up effects may result in underestimation of activities. This effect is not entirely corrected by the dead time correction, and the extent of error increases with increasing dead time. Maximum dead time was about 54 percent at 23 ft. Because the vertical extent of the zone with a dead time greater than 40 percent is limited to only 2 ft, the borehole was not logged with the high rate logging system (HRLS).

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K , ^{238}U , and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated

with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 609 keV because it exhibited slightly higher net counts per second.

Results and Interpretations:

^{137}Cs and ^{60}Co were the man-made radionuclides detected in this borehole. ^{137}Cs was detected in four intervals: from 5 to 13 ft, from 17 to 59 ft, from 89 to 98 ft, and from 212 to 226.5 ft. The maximum apparent activity was 2,700 pCi/g at a log depth of 23.0 ft. ^{60}Co was detected in two intervals: from 18 to 166 ft and from 224 ft to total depth. The range of activities was from the MDL (0.1 pCi/g) to 60 pCi/g, which was detected at 123 ft, and ^{60}Co was detected below the groundwater level.

Photopeaks associated with ^{125}Sb were identified by the APTEC algorithm at 55 ft (601 keV), 56 and 57 ft (428 keV), and 60 ft (636 keV). Confirming photopeaks for ^{125}Sb were apparent at these depths, but the APTEC algorithm did not identify them as statistically significant peaks. ^{125}Sb is probably present in the interval from 55 to 60 ft at activities at or slightly below the MDL (1.0 pCi/g).

The plots of the repeat logs demonstrate reasonable repeatability of the SGLS data for both the man-made and natural radionuclides (609, 1461, 1764, and 2614 keV).

Gross gamma profiles (attached) from Additon et al. (1978) indicate that the sediments surrounding this borehole contained significant amounts of gamma-emitting contamination. The 1959 and 1963 scintillation logs exhibit detector saturation at count rates greater than 4×10^6 counts per minute between approximately 6 and 66 ft (2 and 20 m). The only portion of the profile from 5/4/76 that may not have encountered elevated gamma activity is the interval from 151 to 217 ft (46 to 66 m). The SGLS did not detect man-made radionuclides in the interval from 166 to 212 ft.

References:

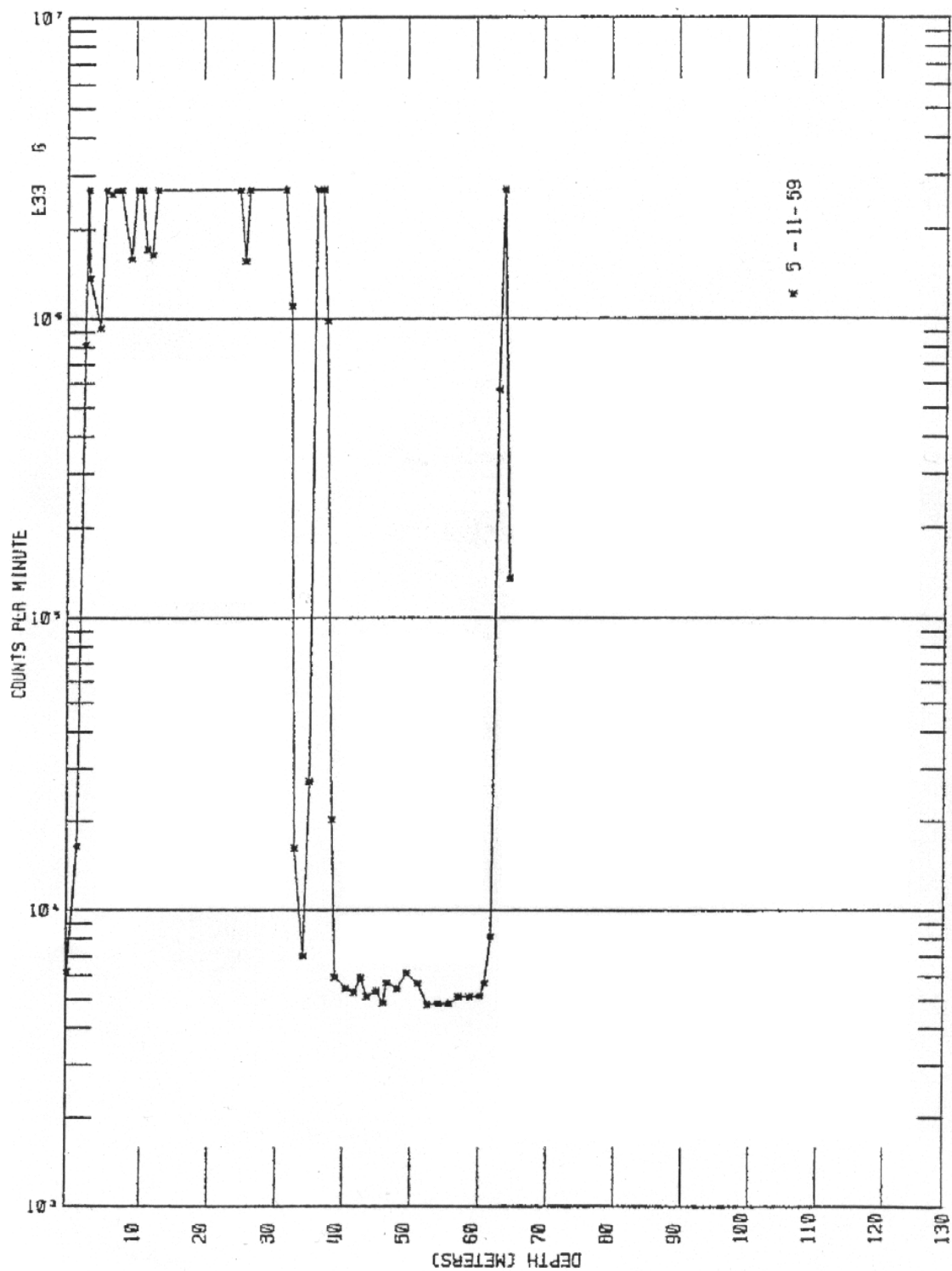
Additon, M.K., K.R. Fecht, T.L. Jones, and G.V. Last, 1978. *Scintillation Probe Profiles From 200 East Area Crib Monitoring Wells*, RHO-LD-28, Rockwell Hanford Operations, Richland, Washington.

Ledgerwood, R.K., 1993. *Summaries of Well Construction Data and Field Observations for Existing 200-East Resource Protection Wells*, WHC-SD-ER-TI-007, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

¹ GWL – groundwater depth

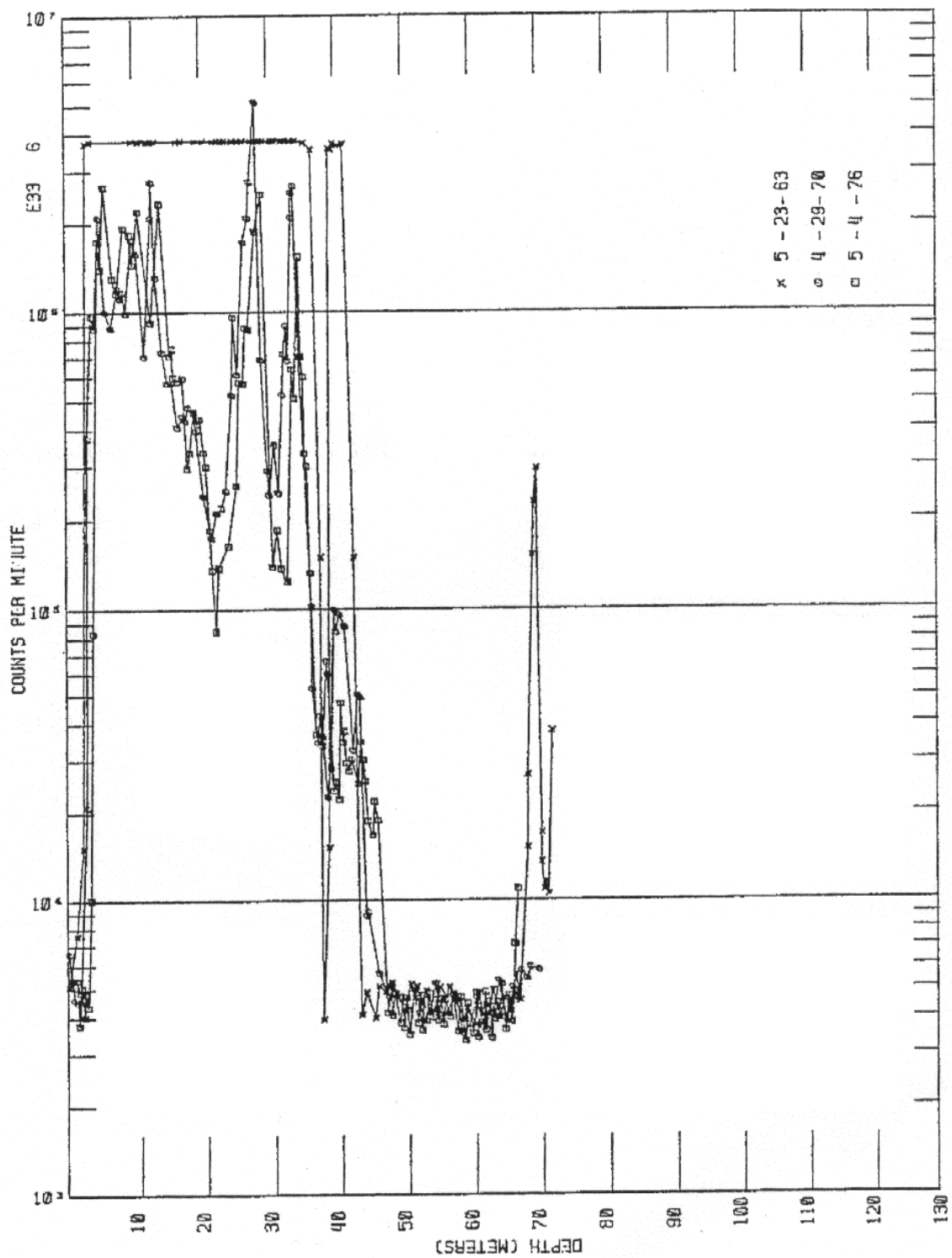
² TOC – top of casing

³ N/A – not applicable



from Additon et al. (1978)

Scintillation Probe Profile for Borehole 299-E33-6 (logged on 5/11/59)

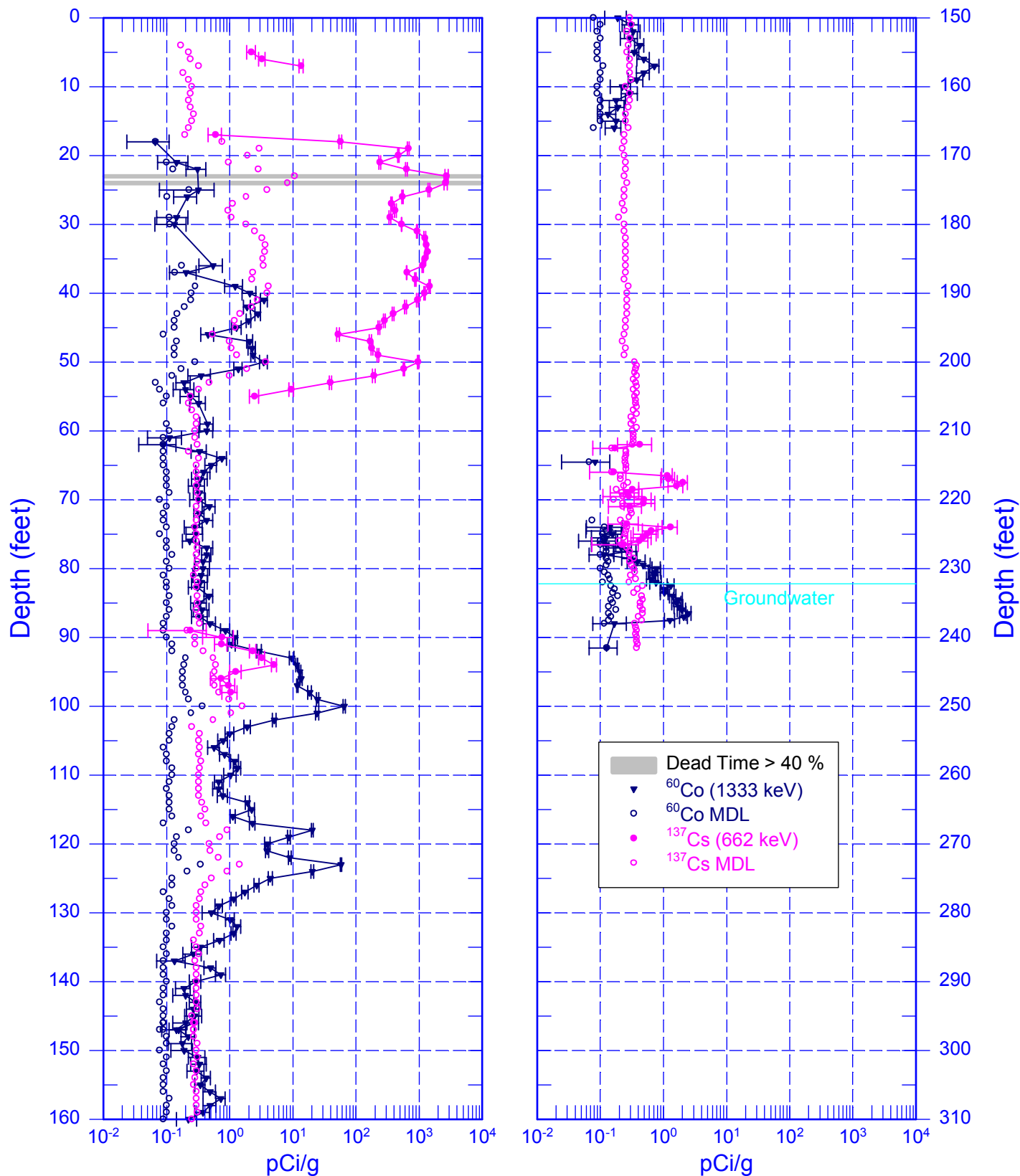


from Additon et al. (1978)

Scintillation Probe Profile for Borehole 299-E33-6 (logged on 5/4/76)

299-E33-6 (A6852)

Man-Made Radionuclides

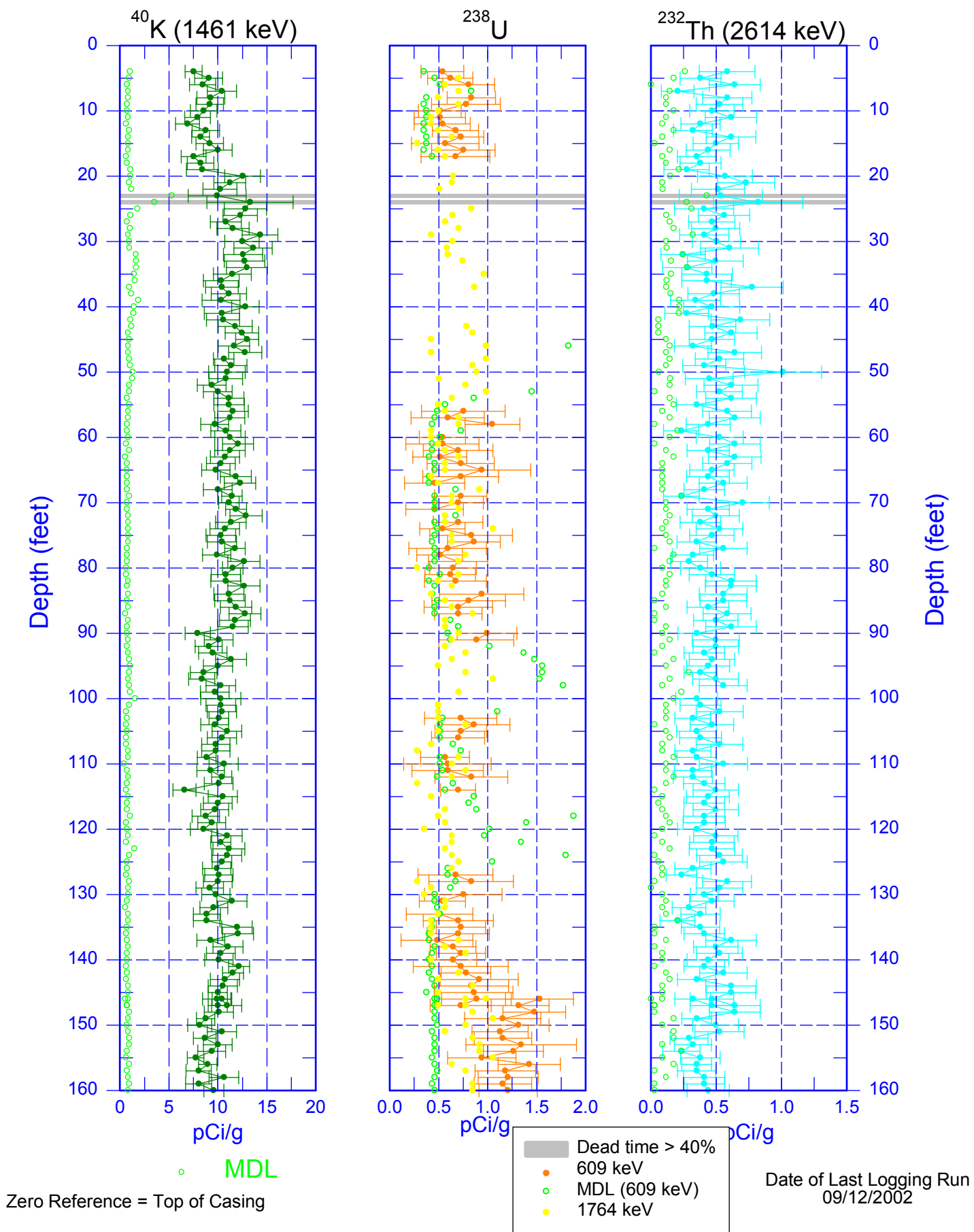


Zero Reference = Top of Casing

Date of Last Logging Run
09/12/2002

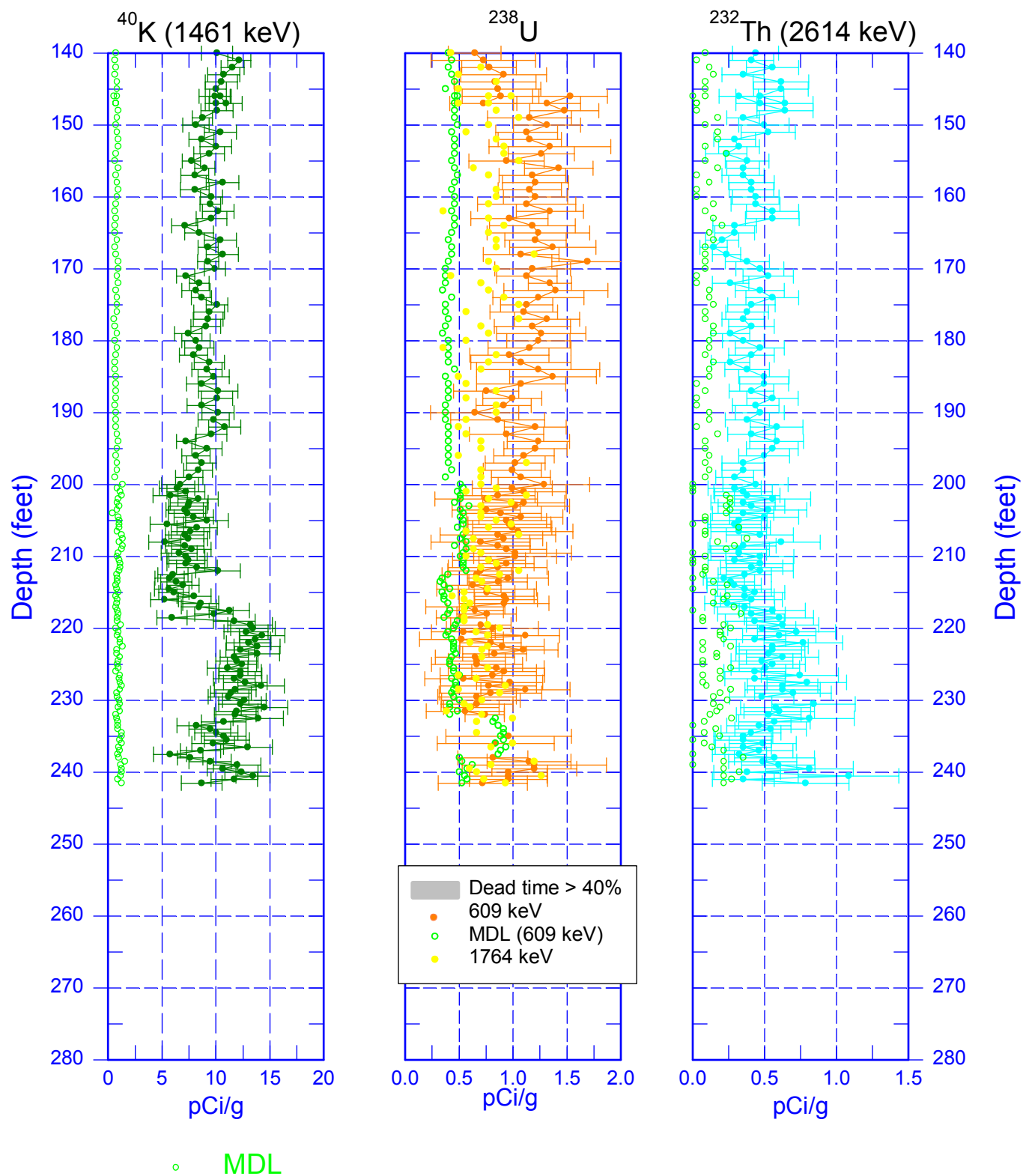
299-E33-6 (A6852)

Natural Gamma Logs



299-E33-6 (A6852)

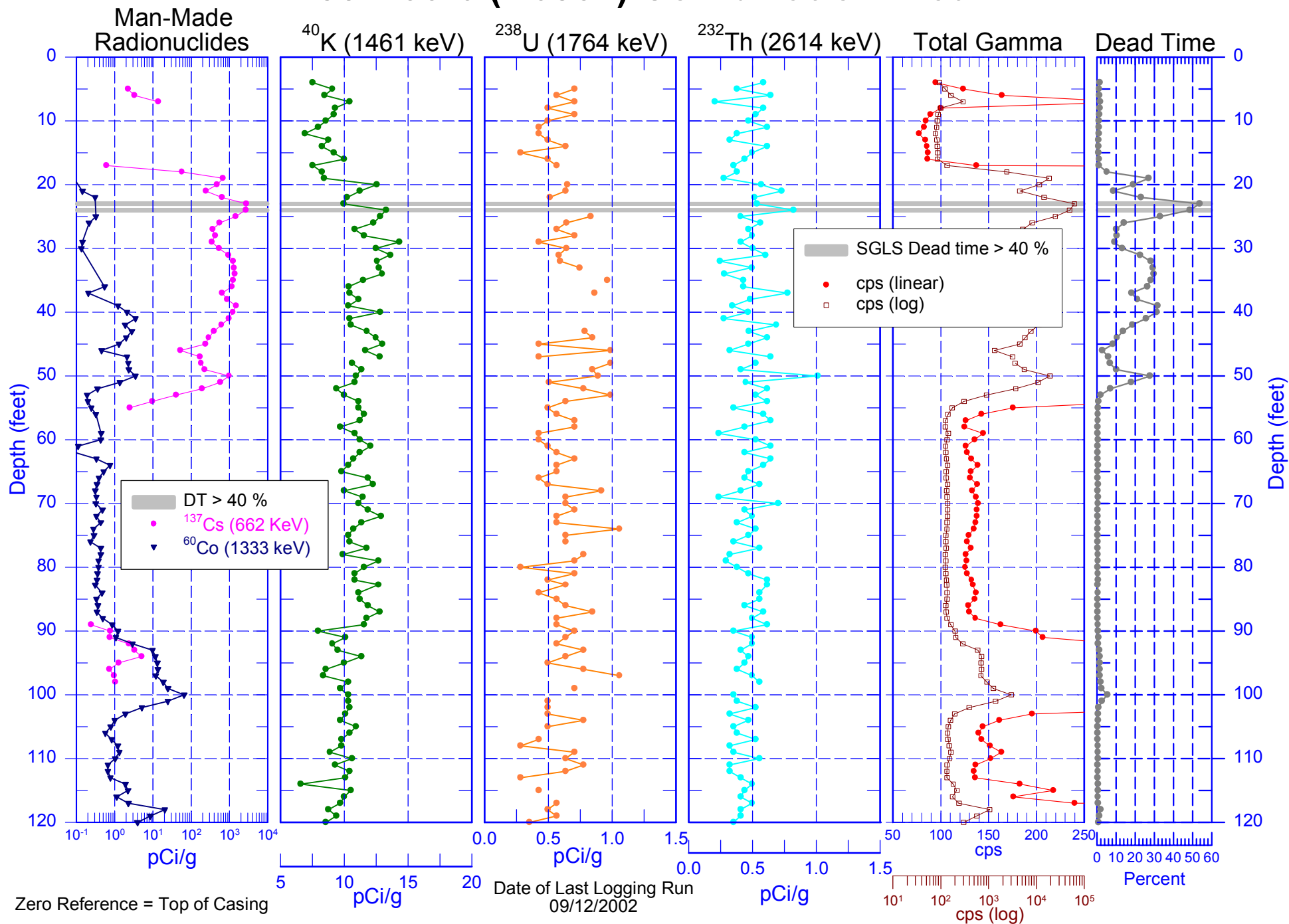
Natural Gamma Logs



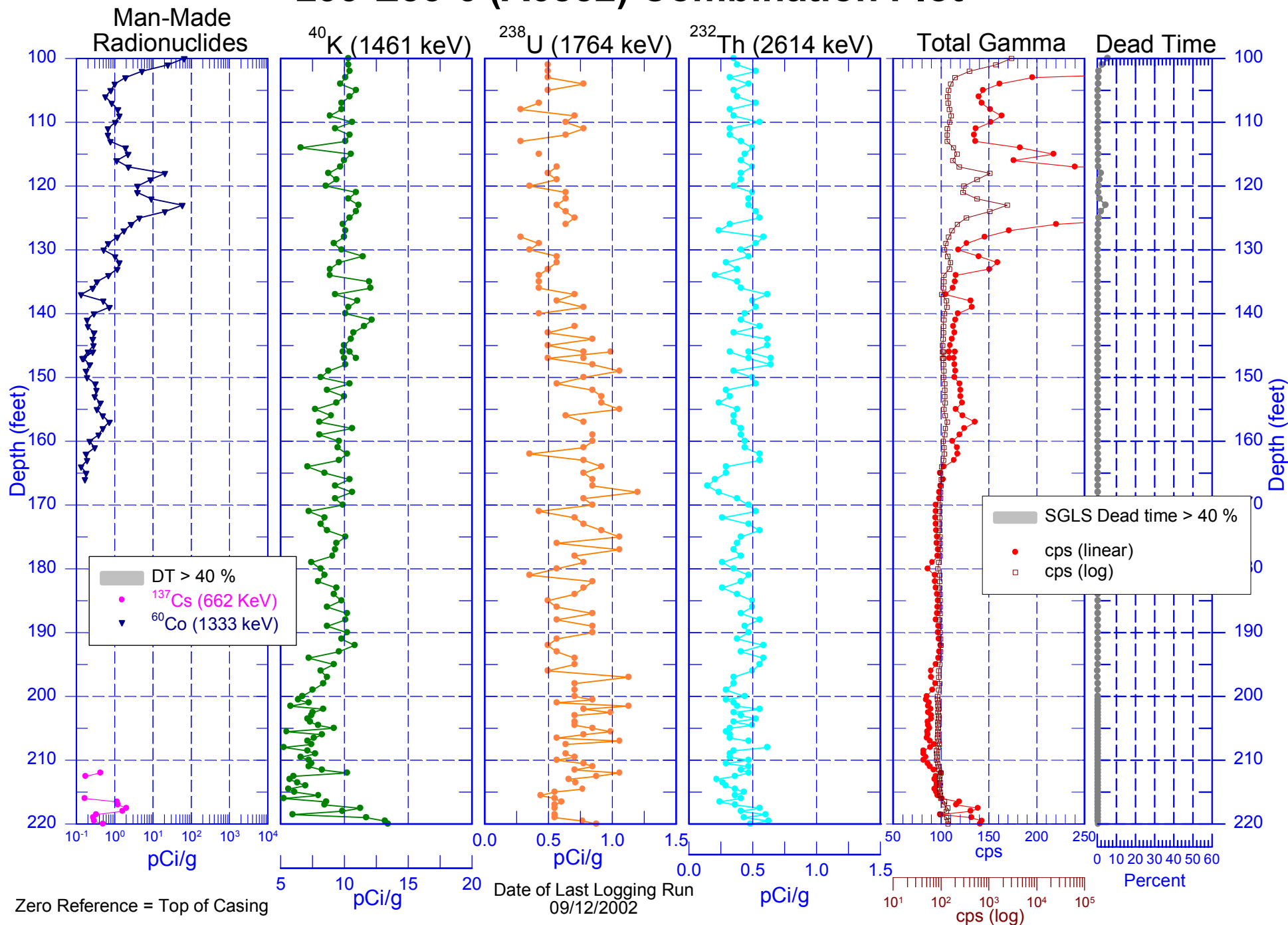
Zero Reference = Top of Casing

Date of Last Logging Run
09/12/2002

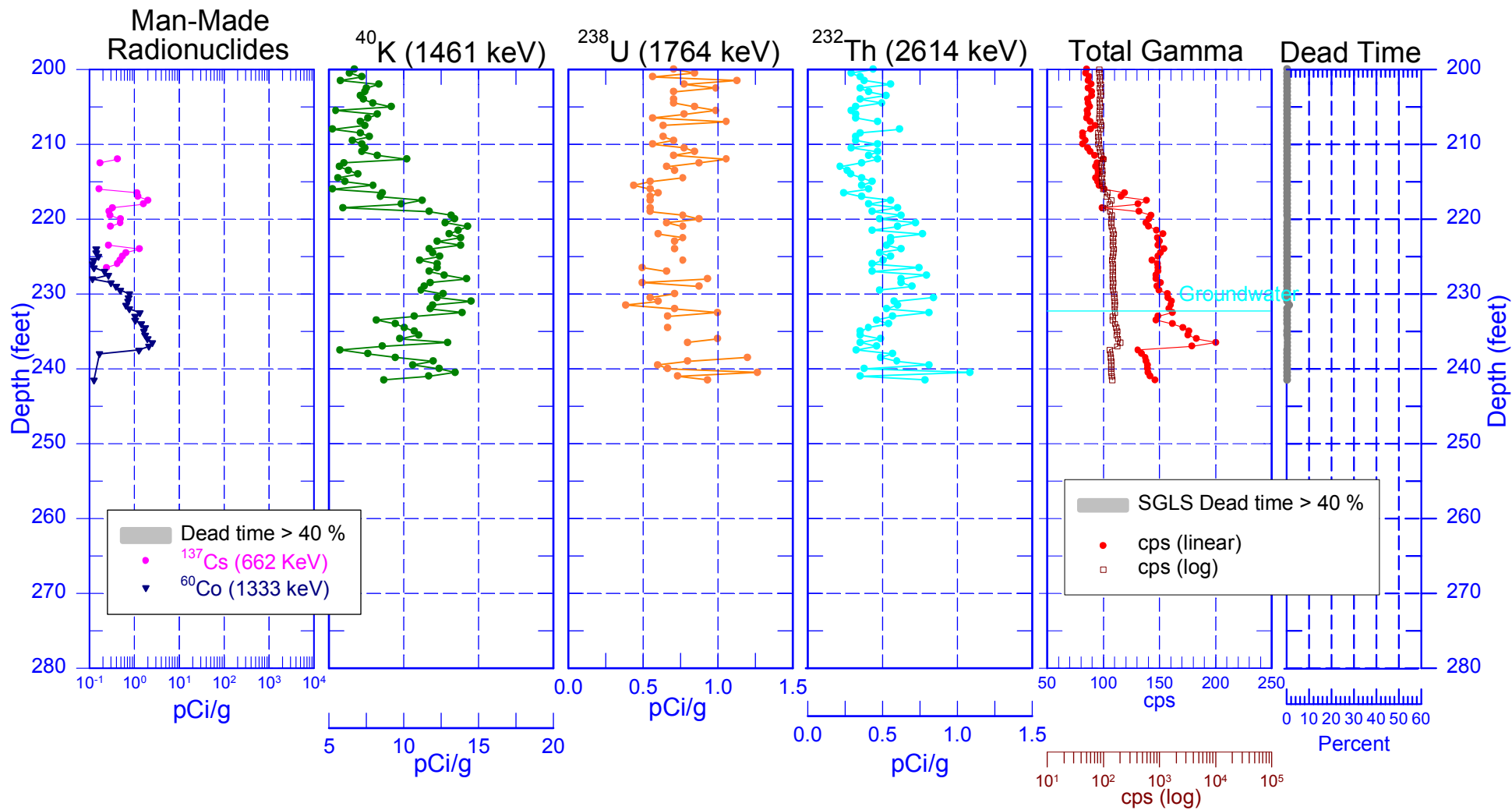
299-E33-6 (A6852) Combination Plot



299-E33-6 (A6852) Combination Plot



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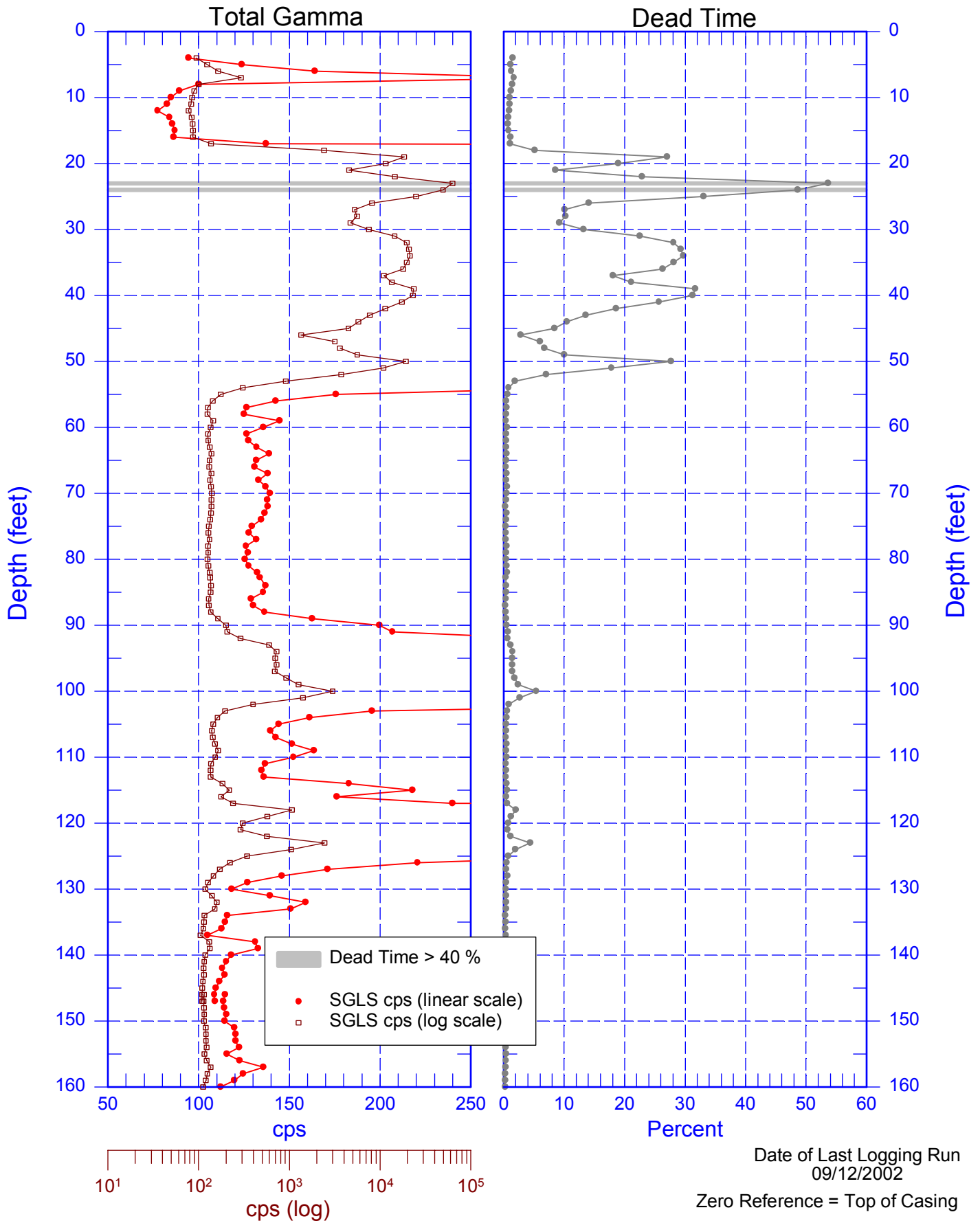


Zero Reference = Top of Casing

Date of Last Logging Run
09/12/2002

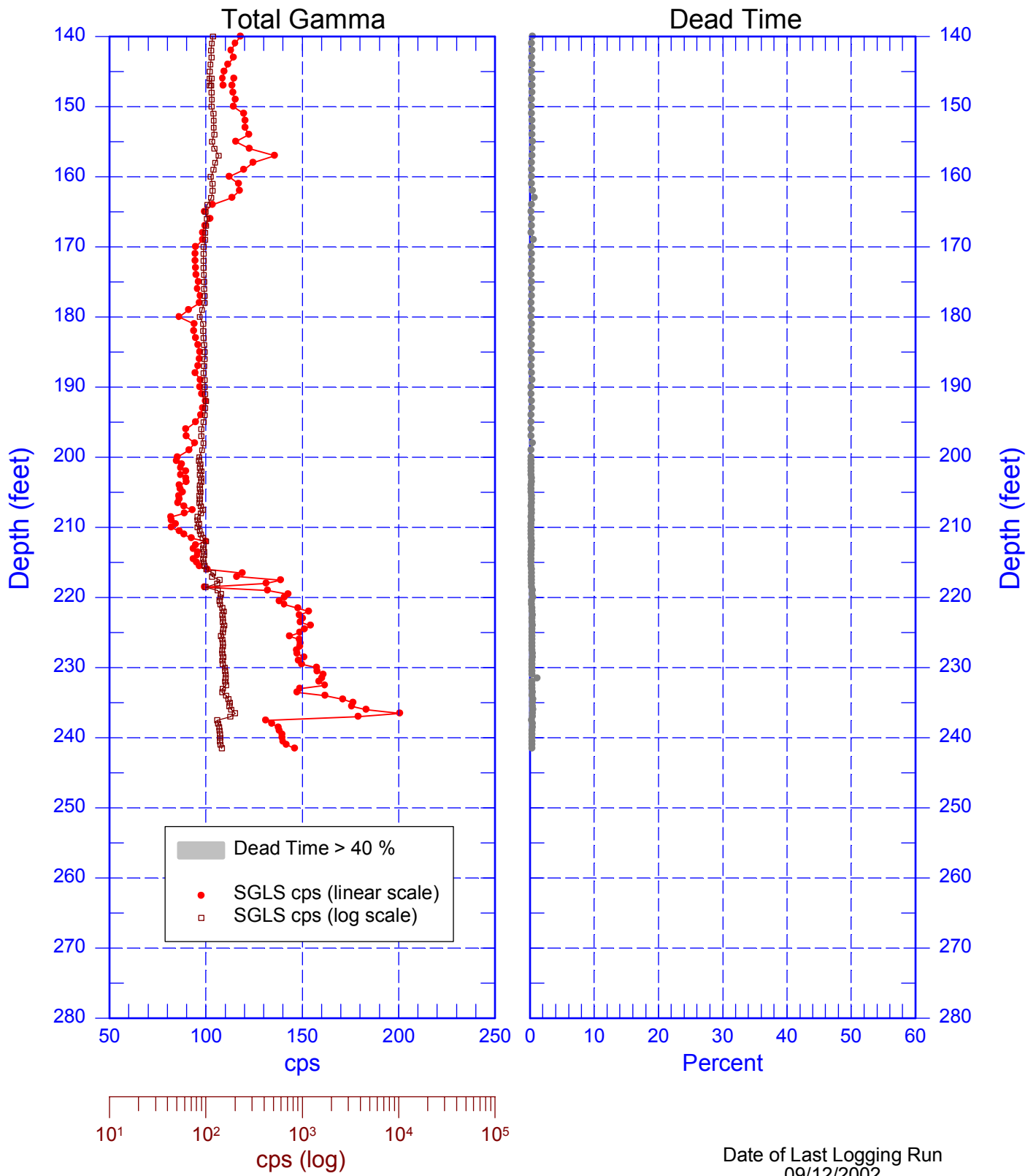
299-E33-6 (A6852)

Total Gamma & Dead Time



299-E33-6 (A6852)

Total Gamma & Dead Time

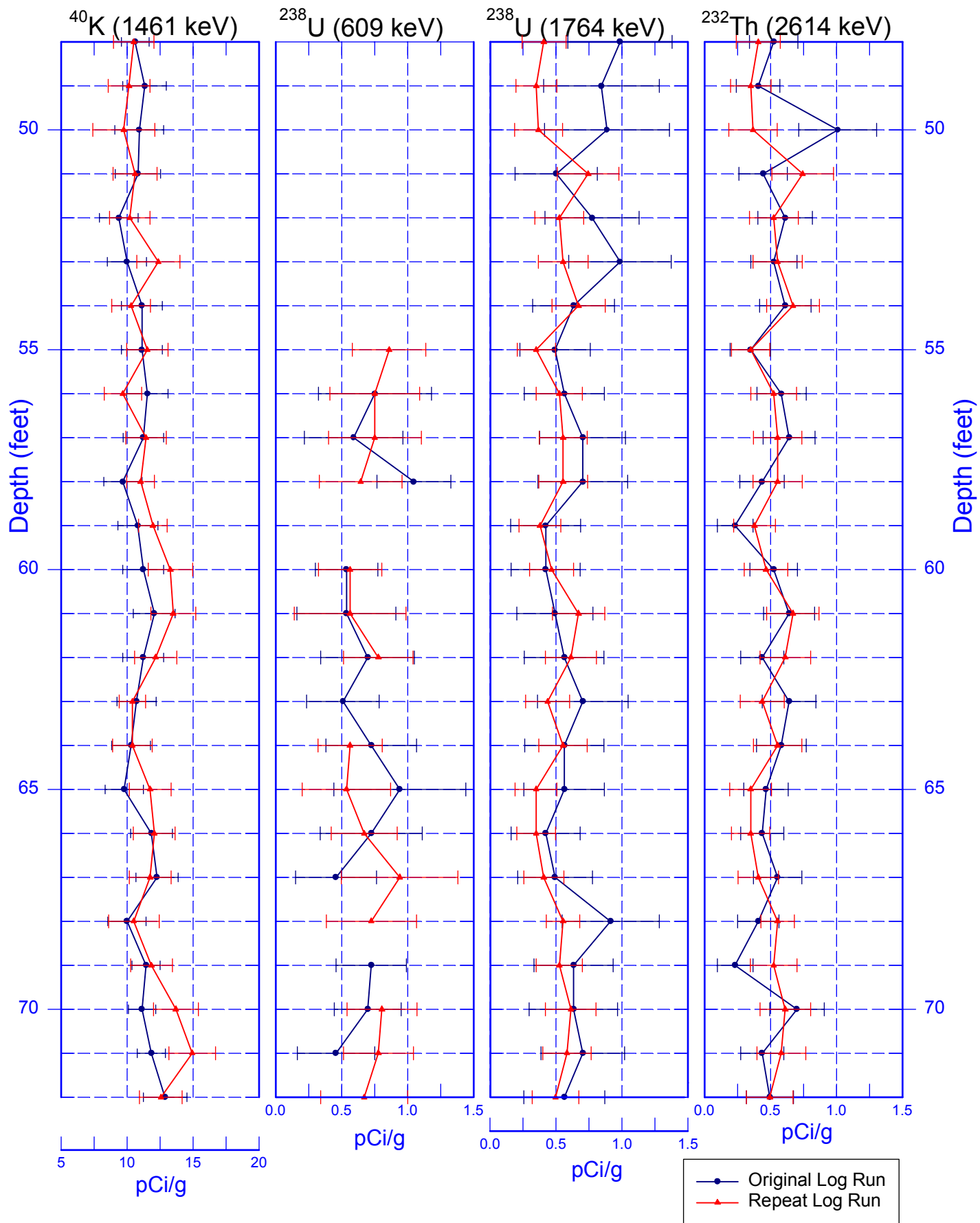


Date of Last Logging Run
09/12/2002

Zero Reference = Top of Casing

299-E33-6 (A6852)

Rerun of Natural Gamma Logs (72.0 to 48.0 ft)



299-E33-6 (A6852)

Rerun of Man-Made Radionuclides (72.0 to 48.0 ft)

